

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE SPECIFICATIONS**

**RESIDUE MANAGEMENT, NO TILL AND STRIP TILL
(Acre)
CODE 329A**

GENERAL SPECIFICATIONS:

The following specifications are provided as guidance to ensure proper implementation of this practice and meet the planned objectives.

Seedbed preparation, planting, and fertilizer placement shall disturb no more than one fourth of the row width.

Residue shall not be disturbed by full width tillage operations except as follows:

Planters or drills shall be equipped to plant directly through untilled residue or in a tilled seedbed prepared in a narrow strip along each row by planter attachments such as rotary tillers, sweeps, multiple coulters, or row cleaning devices.

If row cultivation or spot treatment is required for weed escapes, leveling ruts, or similar operations, tillage shall be limited to those operations which minimize burial of residue.

Crop residue shall be left on the soil surface over winter and may be shredded in the spring (if shredding is practiced) prior to seedbed preparation and planting.

Loose residue planned for retention on the field shall be uniformly distributed on the soil surface. Where combines or similar machines are used for harvesting, they shall be equipped with spreaders capable of distributing residue over at least 80 percent of the working width of the header.

Residue shall not be burned.

All pesticides used shall be registered and applied according to the label and other Federal, State and Local requirements.

Partial removal of residue by means such as baling or grazing shall be limited to retain the amount needed to achieve the desired objectives.

Conserving Soil Moisture:

A minimum quantity of 50 percent residue cover shall be maintained on the soil surface throughout the year for moisture conservation.

Managing snow:

Stubble shall be left standing as high as possible by the harvesting operation, but not less than 6 inches during the winter to trap and retain snow.

When crops are planted in the fall, the width of the tilled strip or slot shall be no more than 1/4 of the row width.

Controlling Sheet and Rill Erosion:

The planted row area shall be level with, or higher than the adjacent row bottoms unless the rows are planted on the contour.

Operation and Maintenance:

1. Special precautions must be taken to ensure that perennial weeds such as bindweed, johnsongrass, and blueweed are not allowed to build up.
2. Appropriate actions must be taken as needed for insect control, particularly around field boundaries, fences, or other infectious sites.
3. Special attention is needed to ensure that eroded areas are repaired in a timely manner.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

Specification - 329A -2

4. Proper operation and maintenance of equipment is needed to enhance this practice.

The following estimates of residue amounts can be used as a guide for successful implementation of a residue management program.

EXHIBIT A				
Estimated Air Dry Residue by Production Various Crops				
<u>Crop</u>	<u>Lbs of Air Dry Residue Expected</u>			
Wheat	100	to	135	per Bushel of Grain
Rye	100	to	120	per Bushel of Grain
Barley	80	to	90	per Bushel of Grain
Oats	50	to	70	per Bushel of Grain
Corn	60	to	70	per Bushel of Grain
Sorghum	70	to	90	per Bushel of Grain
Cotton	3	to	4	per Pound of Lint

EXHIBIT B

CROP RESIDUE

CROP RESIDUE MANAGEMENT

Classes of Crop Residue

- | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>(1) Crop residue has been generally classified as being either Non-Fragile or Fragile.</p> <p>(2) The classification of residue as Non-Fragile or Fragile is a subjective classification based in part on the ease in which crop residue is decomposed by the elements or buried by tillage operations.</p> | <p>(3) Plant characteristics such as composition and size of leaves and stems, density of the residue, and relative quantities produced are considered when assigning classifications.</p> <p>(4) Table #1 lists agronomic and horticultural crops that are generally considered as having Fragile crop residue.</p> <p>(5) Table #2 lists agronomic and horticultural crops that are generally considered as having Non-Fragile residue.</p> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

TABLE 1
CROPS WITH FRAGILE RESIDUE

Canola/Rapeseed	Mustard
Dry Beans	Peanuts
Dry Peas	Potatoes
Fall Seeded Cover Crops	Safflower
Flower Seed	Soybeans
Grapes	Sugar Beets
Green Peas	Sunflower
Guar	Sweet Potatoes
Lentils	Vegetables
Mint	

TABLE 2
CROPS WITH NON-FRAGILE RESIDUE

Alfalfa or legume hay	Pasture
Barley*	Popcorn
Buckwheat	Rye*
Corn	Sorghum
Cotton	Spelts*
Flaxseed	Triticale*
Forage Seed	
Forage Silage	
Grass Hay	
Millet	
Oats	
Wheat*	

* If a combine is used with a straw chopper or otherwise cuts straw into small pieces in harvesting small grain, then the residue should be considered as being fragile.

NOTE: The classifications listed in Tables #1 and #2 are accepted by the Agricultural Research Service (ARS) and by the Equipment Manufacturers Institute (EMI).

Residue Burial

- (1) Tillage implements and other types of field equipment are the most important factors influencing residue burial and the rate of residue decomposition.
- (2) Field operations bury crop residue and mix them with the soil, reducing the amount of residue on the soil surface and increasing the rate of decomposition.
- (3) To plan crop residue management systems for erosion control or other conservation purposes requires a general working knowledge of the degree to which tillage and other field implements bury crop residue, and how much residue is likely to remain on the soil surface after a single pass of that implement.
- (4) Each tillage or planting operation leaves a percent of the residue that was present just prior to that operation. The numbers in Table #3 represent these remaining percentages.
- (5) Many factors affect the amount of residue left after each tillage or planting operation.

Residue levels are sensitive to the depth and speed of equipment operation, and to row spacing.

- (6) Under some conditions, field cultivators, other finishing tools with field cultivator gangs, and some planters and drills return to the surface as much as 20 percent of the residue incorporated at shallower depths by operations that have recently occurred.
- (7) The following general rules of thumb should be used when selecting values from the ranges listed in Table #3:
 - (a) Select values from the lower end of the range in situations where equipment is used at deeper operating depths. At shallower operating depths, more residue is left on the surface; while at deeper operating depths, more residue is buried.
 - (b) Select values from the upper end of the range in situations where equipment is operated at slower speeds. Slower operating speeds tend to leave more residue on the surface; while faster speeds bury more residue.

Specification - 329A -4

- (8) The values in Table #3 may be used as a guide in selecting the types of equipment and types of blades, points, or sweeps to be used in a residue management system. Field measurements of the actual amounts of

residue being left by an operation should be made, and adjustments made accordingly.

TABLE 3
RESIDUE RETENTION-BURIAL, IMPLEMENT OPERATING DATA

Implements:	Residue Remaining (Percent)		Depth of Operation (Inches)
	Fragile Residue	Non-Fragile Residue	
PLOWS			
Moldboard Plow	0-5	0-10	4-8
Disk Plow	5-15	10-20	4-8
MACHINES WHICH FRACTURE SOIL			
Paratill/Paraplow	75-85	80-90	8-12
"V" Ripper/Subsoiler 12-14" deep 20" spacing	60-80	70-90	10-16
Combination Tools:			
Subsoil-chisel	40-50	50-70	10-16
Disk-subsoiler	10-20	30-50	8-16
CHISEL PLOWS With			
Sweeps	50-60	70-85	4-8
Straight chisel spike points	30-60	40-80	4-8
Twisted points or shovels	20-40	35-70	4-8
COMBINATION CHISEL PLOWS			
Coulter Chisel plows with:	40-50	60-80	4-8
Sweeps	25-40	30-60	4-8
Straight chisel spike points	10-30	25-60	4-8
Twisted points or shovels			
Disk Chisel plows with:	30-50	60-70	4-8
Sweeps	25-40	30-60	4-8
Straight chisel spike points	10-30	20-50	4-8
Twisted points or shovels			
UNDERCUTTERS			
Stubble-Mulch sweep or blade plows with:			
Sweep/"V"-Blade > 30" wide	60-80	75-95	3-6
Sweeps 20"-30" wide	50-75	70-90	3-6
DISK			
Offset			
Heavy plowing > 10" spacing	10-25	25-50	4-8
Primary cutting > 9" spacing	20-40	30-60	4-8
Finishing 7"-9" spacing	25-40	40-70	2-6
Tandem			
Heavy plowing > 10" spacing	10-25	25-50	4-8
Primary cutting > 9" spacing	20-40	30-60	4-8
Finishing 7"-9" spacing	25-40	40-70	2-6
Light tandem disk after harvest, before other tillage	40-50	70-80	2-4
One-way disk with:			
12"- 16" blades	20-40	40-50	4-8
18"-30" blades	10-30	20-40	4-8
Single gang disk	40-60	50-70	2-6

TABLE 3 (Continued)
RESIDUE RETENTION-BURIAL, IMPLEMENT OPERATING DATA

Implements:	Residue Remaining (Percent)		Depth of Operation (inches)
	Fragile Residue	Non-Fragile Residue	
FIELD CULTIVATORS: (Including leveling attachments)			
Used as the primary tillage operation:			
Sweeps 12"-20"	55-75	60-80	4-6
Sweeps or shovels 6"-12"	50-70	35-75	4-6
Duckfoot points	30-55	35-60	2-4
Field cultivators as secondary operation following chisel or disk:			
Sweeps 12"-20"	60-75	80-90	2-4
Sweeps or shovels 6"-12"	50-60	70-80	2-4
Duckfoot points	35-50	60-70	2-4
FINISHING TOOLS			
Combination finishing tools with:			
Disks, shanks and leveling attachments	30-50	50-70	2-4
Spring tooth & rolling basket	50-70	70-90	2-4
Harrows			
Springtooth (coil tine)	50-70	60-80	2-4
Spike tooth	60-80	70-90	2-4
Flex-tine tooth	70-85	75-90	2-4
Roller harrow (cultipacker)	50-70	60-80	1-2
Packer roller	90-95	90-95	1-2
Rotary Tiller			
Secondary operation 3" deep	20-40	40-60	3
Primary operation 6" deep	5-15	15-35	6
RODWEEDERS			
Plain rotary rod	50-60	80-90	2-4
Rotary Rod with semi-chisels or shovels	60-70	70-80	2-4
STRIP TILLAGE MACHINES			
Rotary tiller, 12" tilled on 40" rows	50-60	60-75	4-6
ROW CULTIVATORS (30" and wider)			
Single sweep per row	55-70	75-90	1-3
Multiple sweeps per row	55-65	75-85	1-3
Finger wheel cultivator	50-60	65-75	1
Rolling disk cultivator	40-50	45-55	1-3
Ridge Till cultivator	5-25	20-40	1-3
UNCLASSIFIED Machines			
Anhydrous applicator	45-70	75-85	4-8
Anhydrous applicator with closing disks	30-50	60-75	4-8
Subsurface manure applicator	40-60	60-80	4-8
Rotary Hoe	80-90	85-90	1
Bedders, lister & hippers	5-20	15-30	2-6
Furrow diker	75-85	85-95	2-6
Mulch Treader	60-75	70-85	2-4

TABLE 3 (Continued)
RESIDUE RETENTION-BURIAL, IMPLEMENT OPERATING DATA

Implements:	Residue Remaining (Percent)		Depth of Operation (inches)
	Fragile Residue	Non-Fragile Residue	
DRILLS			
Hoe Opener drills	40-60	50-80	1-2
Semi-deep furrow drill or press drill (7"-12" spacing)	50-80	70-90	1-2
Deep furrow drill with > 12" spacing	50-80	60-80	1-2
Single disk opener drills	75-85	85-100	1-2
Double disk opener drills (conventional)	60-80	80-100	1-2
No-till drills and drills with the following attachments in standing stubble:			
smooth no-till coulters	70-85	85-95	1-2
Ripple or bubble coulters	65-85	80-85	1-2
Fluted coulters	60-80	75-80	1-2
No-till drills and drills with the following attachments in flat residue:			
Smooth no-till coulters	50-70	65-85	1-2
Ripple or bubble coulters	45-65	60-75	1-2
Fluted coulters	40-60	55-70	1-2
Air seeders: (Refer to appropriate field cultivator or chisel plow depending on the type of ground engaging device used.)			
Air drills: (Refer to corresponding type of drill opener.)			
ROW PLANTERS			
Conventional planters with	80-90	85-95	1-2
Runner openers	85-95	90-95	1-2
Staggered double disk openers	75-85	85-95	1-2
Double disk openers			
No-till planters with	75-90	85-95	1-2
Smooth coulters	70-85	75-90	1-2
Ripple coulters	55-80	65-85	1-2
Fluted coulters			
Strip till planters with			
2 or 3 Fluted coulters	50-75	60-80	1-2
Row cleaning devices	50-60	60-60	1-2
(8"-14" wide bare strip using brushes)			
Ridge till planter	20-40	40-60	1-2
CLIMATIC EFFECTS			
Over winter weathering			
Following summer harvest	65-85	70-90	1-2
Following winter harvest	70-80	80-95	1-2

(10) References:

- (a) Natural Resources Conservation Service (USDA) and Equipment Manufacturers Institute, 1992, as revised 1993. "Estimates of Residue cover

Remaining After Single Operation of Selected Tillage Machines."

- (b) Agricultural Research Service, National Soil Erosion Research Laboratory, West Lafayette, Indiana.